



Natural Heritage & Endangered Species Program

Massachusetts Division of Fisheries & Wildlife

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Kennedy's Emerald Dragonfly

Somatochlora kennedyi

State Status: **Endangered**

Federal Status: None

DESCRIPTION: Kennedy's Emerald (*Somatochlora kennedyi*) is a large, slender insect belonging to the order Odonata, sub-order Anisoptera (the dragonflies), and family Corduliidae (the emeralds). Emeralds of the genus *Somatochlora*, which includes Kennedy's Emerald, are generally large, dark dragonflies with at least some iridescent green coloration, brilliant green eyes in the mature adults (brown in young individuals), and moderate pubescence (hairiness), especially on the thorax. The face of the Kennedy's Emerald is largely metallic green. The large eyes, which meet at a seam on the top of the head, are brilliant green in mature adults; brown in less mature individuals. Each side of the thorax is marked with two wide and indistinct pale stripes separated by thin lines of metallic green coloration. These stripes become increasingly dull with age. The top of the thorax is metallic green. The cylindrical abdomen is highly constricted at its base, widening to segment five (dragonflies and damselflies have 10 abdominal segments) and then narrowing slightly towards the distal end. The abdomen is black with a metallic green sheen. In the females, segments 1 and 2 have extensive yellow on the sides. The wings of this species are transparent and are supported by a dense system of dark veins.

Adult Kennedy's Emeralds range from 2 to 2.2 inches (51 to 55 mm) in length. Male and female Kennedy's Emeralds are similar in coloration, though the female is larger.

SIMILAR SPECIES: The Kennedy's Emerald is similar to other species of the genus *Somatochlora* in Massachusetts, though several characters can help distinguish it from all other species. Kennedy's Emerald differs most dramatically from other species of *Somatochlora* by the form of the terminal abdominal appendages in males (Nikula *et al.* 2003) and the form of the vulvar lamina in the females, as represented in Walker and Corbet (1975) and Needham *et al.* (1999). A microscope or magnifying lens is needed to observe the distinctive characteristics of the terminal abdominal appendages and vulvar lamina. The thoracic markings of Kennedy's Emerald, consisting of two stripes on each side of the thorax, are very wide and ill-defined, especially in older individuals. This helps distinguish it from many of Massachusetts' *Somatochlora*. A few species of *Somatochlora* (e.g., *S. incurvata* and *S. williamsoni*) also have similar thoracic markings that become duller with age. However, the markings of these species are much thinner than in Kennedy's Emerald. Also, these species are generally larger than Kennedy's Emerald and have distinctive terminal abdominal appendages and vulvar lamina. The Forcipate Emerald (*S. forcipata*) is the most similar species



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to Kennedy's Emerald in size and shape. However, the Forcipate Emerald has two distinct tear drop shaped yellow markings on the sides of its thorax, rather than the wide, indistinct markings found on the Kennedy's Emerald.

The nymphs can be distinguished by characteristics of the pubescence on the dorsal surface of the abdomen as per the keys in Needham *et al.* (1999) and Soltesz (1996).

HABITAT: In Massachusetts, the Kennedy's Emerald has been found inhabiting small streams and Red Maple (*Acer rubrum*) swamps. Elsewhere in its range, Kennedy's Emerald is sometimes associated with streams flowing through open habitats, such as marshes and bogs.

LIFE-HISTORY/BEHAVIOR: Kennedy's Emerald is the earliest flying *Somatochlora* in Massachusetts. It has been recorded as early as late May and generally flies only into early July when most other species are just beginning their flight season.

KENNEDY'S EMERALD FLIGHT PERIOD

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Please allow the Natural Heritage & Endangered Species Program to continue to conserve the biodiversity of Massachusetts with a contribution for 'endangered wildlife conservation' on your state income tax form as these donations comprise a significant portion of our operating budget.

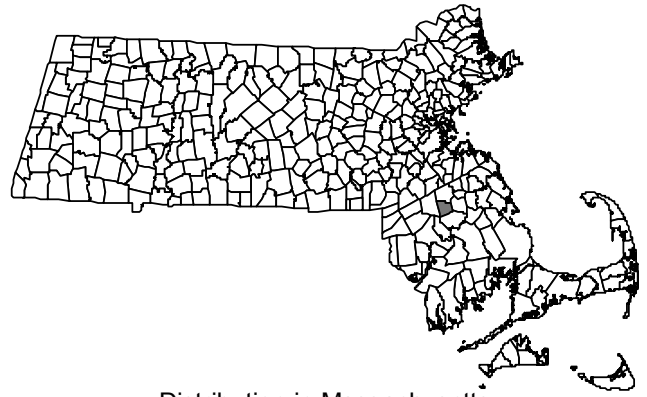
Although little has been published about the life cycle of Kennedy's Emerald in particular, information documented for other dragonfly species is most likely applicable. Like damselflies, dragonflies have two distinct life stages: an aquatic larval stage (nymph) and the flying adult.

Dragonfly and damselfly nymphs possess a unique feeding apparatus - a moveable, hinged labium, or lower lip, that is folded beneath the head of the nymph. When a prey item is within reach, this lower lip can be extended forward to secure the hapless animal with hooks at the end of the labium. The prey item is then retracted to the mandibles to be consumed. Prey is generally captured using an ambush technique, with the nymph remaining still until a potential meal comes within reach. Dragonfly nymphs are voracious predators feeding on a variety of aquatic life, including a wide variety of aquatic insects, small fish, and tadpoles.

The nymphal stage generally takes about a year, but may take longer in some species (5 or more years). The final stage of development in dragonflies is emergence from the nymph to adult stage. The nymph of Kennedy's Emerald crawls up into emergent or streamside vegetation or onto the stream's bank to emerge. Immediately following emergence the adult is very compacted, especially the wings and abdomen. The insect takes in air, shunting fluid through its veins and expanding its wings and abdomen. As soon as the abdomen and wings are fully expanded, the adult takes its first flight. This maiden flight usually carries the individuals up into surrounding forest, where it spends several days maturing and feeding. There it is more protected from predation and inclement weather. Adult Kennedy's Emeralds can be found in fields and forest clearings which they patrol in search of small aerial insects, such as flies and mosquitoes, on which they feed. When not feeding, Kennedy's Emeralds rest hanging vertically from the branches of bushes and trees. The adult coloration is acquired and the dragonfly becomes sexually mature, which usually takes about a week, before returning to the breeding habitat to initiate mating.

Breeding in Massachusetts probably occurs from mid-June through early July, as in other regions where this species occurs. At the breeding habitat, male dragonflies spend much of their time seeking out females and driving off competing males. Kennedy's Emeralds patrol the more shaded portions of streams where they often hover in one location, though never for very long. Males will occasionally come to rest upon low bushes surrounding the breeding habitat before quickly resuming their patrol for females. The joined pair quickly flies off into the surrounding upland habitat to mate.

Following mating, oviposition occurs. Females of the genus *Somatochlora* oviposit alone and deposit their eggs directly into the substrate by tapping the tip of the abdomen on its surface. Kennedy's Emeralds are known to prefer oviposition sites in the more shaded portions of their stream habitat. In these shaded areas, they can be seen ovipositing in the more densely vegetated areas.



Distribution in Massachusetts
1977 - 2002

Based on records in Natural Heritage Database

RANGE: Kennedy's Emerald is distributed from the Maritime Provinces to Manitoba and the Northwest Territories, south to Massachusetts, northern New York, Ohio, Michigan, Wisconsin, and Minnesota.

POPULATION STATUS IN MASSACHUSETTS:

Kennedy's Emerald is listed as an Endangered species in Massachusetts. As with all species listed in Massachusetts, individuals of the species are protected from take (picking, collecting, killing, etc...) and sale under the Massachusetts Endangered Species Act. The species is known from only five locations in the state. Kennedy's Emerald has been recorded only twice in the last 60 years and efforts should be made to determine the status of this species at historical sites and to find new populations in Massachusetts.

MANAGEMENT RECOMMENDATIONS: As for many rare species, exact needs for management of Kennedy's Emerald are not known. As an inhabitant of streams, Kennedy's Emerald is vulnerable to habitat alteration such as damming and alterations to flow regimes, along with many other aquatic impacts such as chemical pollution and salt and other run-off from roadways. The upland borders of these river systems are also crucial to the well-being of odonate populations as they are critical for feeding, resting, and maturation. Development of these areas should be discouraged and preservation of the remaining undeveloped upland bordering the streams and swamps should be a top priority.

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